MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2016/2017

EBM7011 – QUALITY SYSTEMS MANAGEMENT

(MScEBM)

1st MARCH 2017
9:00 am - 11:00 am
(2 Hours)

INSTRUCTION TO STUDENTS

1. This Question paper consists of **12** pages, including cover page, with **2** sections. Attempt **ALL** questions.
2. **Section A** consists of Multiple Choice Questions. Write your answers on the Multiple Choice answer sheet given and attach it together with your answer Booklet of **Section B**.
3. **Section B** consists of descriptive and statistical questions. Provide your solutions on the answer Booklet given. Any graphs drawn on graph papers must be attached together with the answer Booklet.

SECTION A: Multiple Choice Questions, answer All (25 Marks)

1. The overall intentions and direction of an organization with regard to quality as formally expressed by top management is a:
   (a) Quality Plan
   (b) Quality Statement
   (c) Quality Policy
   (d) TQM
   (e) Quality Objective

2. The definition of quality that involves the product functioning as expected without failure is
   (a) Performance.
   (b) Conformance.
   (c) Reliability.
   (d) Standardization.
   (e) Endurance.

3. The process of evaluating overall performance of project or production process, on a regular basis to provide confidence that the project/production line will satisfy the relevant quality standards is called:
   (a) Quality Assurance
   (b) Quality Control
   (c) Quality Planning
   (d) Quality Review
   (e) Quality Audit

4. The process of monitoring specific results of production process or project to determine if they comply with relevant quality standards is called:
   (a) Quality Assurance
   (b) Quality Control
   (c) Quality Planning
   (d) Quality Review:
   (e) Quality Audit

5. In statistical process control, what measures the central tendency of a set of data?
   (a) Coefficient of variation
   (b) Variance
   (c) Standard deviation
   (d) Mean
   (e) Range

Continued....

6. The following quality gurus are matched with their best known contributions to quality, except
   (a) Walter Shewhart – PDCA cycle
   (b) Kaoru Ishikawa – Cause and Effect diagram
   (c) Deming – 14-Points for management
   (d) Philips Colby – Quality is free
   (e) Joseph Juran – Juran Method.

7. In Control Charts, upper and lower control limits are usually set at ± how many standard deviations from the mean?
   (a) 0.5
   (b) 1.0
   (c) 2.0
   (d) 3.0
   (e) 6.0

8. You are the Manager of a tyre manufacturing company. As part of Quality Control you decide to check only 10% of the tyre generated for environmental check. Which technique are you using?
   (a) Pareto Diagram
   (b) Control Charts
   (c) Statistical Sampling
   (d) Ishikawa diagram
   (e) Sample Selection

9. When analysing quality of a product, a Product Manager decides to use a tool. This tool provides a creative way to look at the causes or potential causes of a quality problem. Which tool do you think the Product Manager plan to use?
   (a) Pareto diagram
   (b) Control chart
   (c) Statistical sampling
   (d) Ishikawa diagram
   (e) PDCA diagram

10. Which of the following theory was rigorously championed by Deming?
    (a) Kaizen and its continuous small improvements to reduce costs and ensure consistency.
    (b) Marginal Analysis
    (c) Expectancy theory - people expect to be rewarded for their efforts.
    (d) Plan-do-check-act to improve quality.
    (e) Trilogy philosophy

11. In six-sigma, the level of defects is reduced to approximately
    (a) 2.4 parts per million.
    (b) 1.4 parts per million.
    (c) 24.4 parts per million.
    (d) 3.4 parts per million.
    (e) 34.4 parts per million.

Continued....

12. Cost of quality includes:
    (a) Cost of all work to build a product or service that conforms to the requirements
    (b) Training programs
    (c) Cost of all work resulting from non-conformance to the requirements
    (d) (a) and (b)
    (e) All of the above

13. Which of the following statements about the cost of quality are true?
    (a) The cost of quality is the expense of non-conformance to requirements and specifications
    (b) The costs of quality are mostly the direct responsibility of workers who are manufacturing the product
    (c) Quality control programs should only be implemented when the costs of quality is low
    (d) (a) and (b)
    (e) (a) and (c)

14. A company incurred the following quality costs at the beginning of the year.
    Evaluating finished product RM105,000
    Quality auditor training RM25,000
    Manufacturability study RM25,000
    Repairing finished product $20,000
    Process capability studies RM30,000

    How much did the company spend on prevention costs?
    (a) RM185,000
    (b) RM80,000
    (c) RM70,000
    (d) RM205,000
    (e) RM130,000

15. For the standard normal distribution, how much confidence is provided within 2 standard deviations above and below the mean?
    (a) 97.22%
    (b) 95.44%
    (c) 99.74%
    (d) 99.87%
    (e) 90.00%

16. For the standard normal distribution, how much confidence is provided within 3 standard deviations above and below the mean?
    (a) 97.22%
    (b) 95.44%
    (c) 99.74%
    (d) 99.87%
    (e) 90.00%.

Continued....

17. In SPC, p-chart is used to monitor the manufacturing process when
    (a) only the number of defective items is known, but not the total samples.
    (b) the number of defective items and the total number of samples are known.
    (c) changes in the mean of measured samples are to be monitored.
    (d) the standard deviation or variability of measured samples is to be monitored for improvement purposes.
    (e) control charts for variables are not available.

18. A six sigma team has been formed to improve an existing process. Which of the following tools should the team use first to gain a clear understanding of the current process?
    (a) Flowchart.
    (b) Pareto chart.
    (c) Process FMEA.
    (d) Taguchi Loss Function.
    (e) Check sheet.

19. Which of the following is not a tool used to perform Quality Control process.
    (a) Inspection
    (b) Benchmarking
    (c) Flow charting
    (d) Histogram
    (e) (b) & (c)

20. When analysing quality a project, a tool provides a creative way to look at the causes or potential causes of a problem. What is this tool called?
    (a) Cause and effect diagram
    (b) Scatter diagram
    (c) Ishikawa diagram
    (d) Pareto diagram
    (e) (a) and (c)

21. The quality improvement approach defined by best practices is
    (a) quality function deployment
    (b) benchmarking
    (c) quality by design practice
    (d) ISO 14000
    (e) GMP

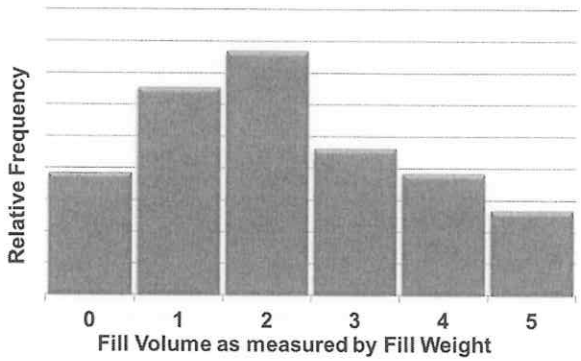
22. In statistical quality control, variation in the production process leads to:
    (a) quality defects.
    (b) process improvement opportunities.
    (c) quality improvements.
    (d) product consistency.
    (e) service improvements.

Continued....

23. What are the four most common control charts?
    (a) x-bar, R, p, c
    (b) x-bar, R, p, OC
    (c) x-bar, R, c, OC
    (d) x-bar, p, c, OC
    (e) R, p, c, OC

24. Quality is:
    (a) Zero defects found
    (b) Conformance to requirements
    (c) The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs
    (d) (b) and (c)
    (e) All the above

25. Legal requirements specify that a bottled product must contain at least the volume printed on the label. A bottling company wants to reduce the amount of overfilled bottles.



On the basis of the data above, what is the most effective strategy to accomplish this task?
    (a) Decrease the target fill volume only
    (b) Decrease the target fill variation only
    (c) First, decrease the target fill volume, then decrease the target fill variation
    (d) First, decrease the target fill variation, then decrease the target fill volume
    (e) First, decrease the target fill variation, then increase the target fill volume

Continued....

SECTION B

Question 1

(a) Define the terms Total Quality Management (TQM), Just-in-Time (JIT) and Kaizen. Briefly indicate what they have in common. [9 marks]

(b) The basic philosophy of TQM is the recognition that a work activity is a *process.* With the help of a suitable diagram, describe how a supplier of an organisation is linked to the organisation's eventual customers [8 marks]

(c) A TQM initiative in an organisation requires the application of *tools* and the participation of the people of the organisation. Give four examples of these tools and briefly describe how they are used in TQM implementation. [4 marks]

(d) To ensure a successful implementation of TQM initiative, name four basic quality elements that must be present, and for each, briefly explain why it is required. [4 marks]

Question 2

(a) Joseph Juran's contributions as embodied in his *Quality Control Handbook*, are a classic guide in the implementation of continuous improvement initiatives. As a quality manual, the *Handbook* outlines Juran's management ideas and methodology.

(i) Name this methodology and describe its main components. [3 marks]

(ii) Draw a representation of this methodology, and show the difference sequence and performance over time. [4 marks]

(iii) For each of these components, describe its objective(s) and how to achieve this/these objective(s). [9 marks]

(b) The ISO 9000:2015 is the latest revision of the ISO 9001 standard. It is a set of quality management system standards that is founded on a set of Quality Management Principles (QMP).

(i) Identify all the QMPs of ISO9000:2015 and describe briefly the purpose of any 2 (Two) of these management principles. [6 marks]

(ii) Identify and briefly describe the QMP of ISO 9001's earlier revision, which has now been omitted in Revision 2015. [3 marks]

Continued....

Question 3

(a) As part of the on-going TQM initiative, JG Glass Industry plans to improve the reliability of its manufacturing process. Its glass-making operation consists of 3 (Three) subsystems as shown in Figure Q3(a)(i). After a scheduled preventive maintenance activity was carried out on Subsystems A and B, the maintenance team has found that the probability of each of these subsystems to operate is 99.99%.

(i) Calculate the reliability of Subsystem B if the overall reliability of the production system, R_S was estimated to be 0.99. [2 marks]

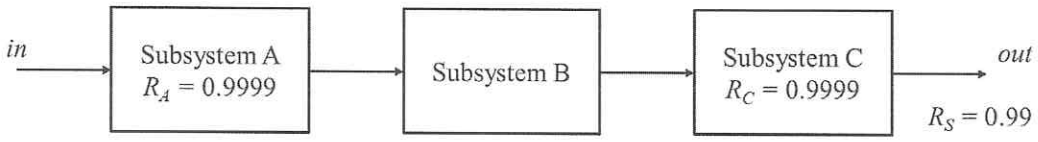


Figure Q3(a)(i): JG Glass Industry Production Subsystems

(ii) To improve the reliability of Subsystem B, a similar subsystem with a reliability figure of 0.999 is connected in parallel as shown in Figure Q3(a)(ii). Calculate the new reliability of the entire system. [3 marks]

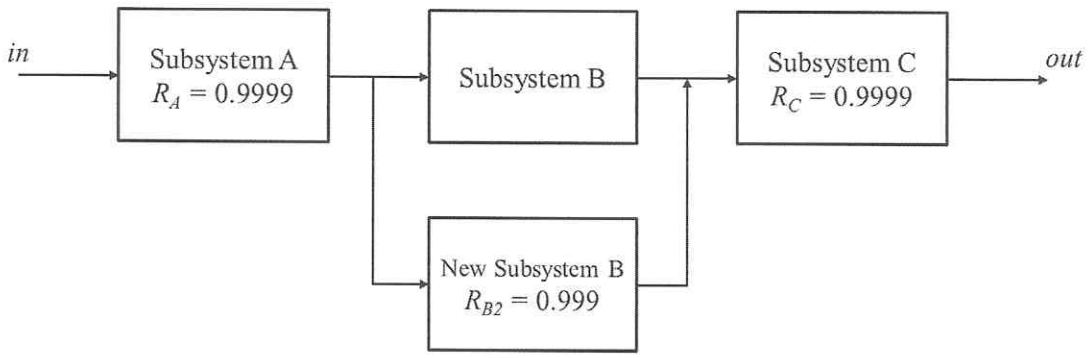


Figure Q3(a)(ii): Improvement of JG Glass Industry Subsystems

Continued....

(b) A quality control inspector at MyCola Softdrink Co. has taken 15 (Fifteen) samples with 4 (Four) observations each of the volume of bottles filled. The data and the computed means are shown in Table Q4 below. If the standard deviation of the bottling operation of 500 millilitre soft drink is 4.41 millilitre, use this information to perform the followings:

(i) Complete Table Q3(b) by calculating the remaining mean volume of the soft drink content ($\bar{X}$) and the range, R, of each sample. [2 marks]

(ii) Find the average of the sample means ($\bar{\bar{X}}$) and the mean range $(\bar{R})$ of the samples. [4 marks]

(iii) Calculate and develop the control limits of 3 standard deviations, for the x-bar chart of the manufacturing operation. [4 marks]

(iv) Plot the x-bar chart showing both the upper and lower control limits. [4 marks]

(v) Using the Table of Control Chart Constants for R-Chart (see Page 11), determine the Upper Control Limit (UCL) and Lower Control Limit (LCL) of the R-bar chart and plot the graph. [6 marks]

Sample Number	Content of Soft Drink in millilitre				Average $\bar{x}$	Range R
	Observation 1	Observation 2	Observation 3	Observation 4		
1	507.20	512.64	516.80	509.76	511.60	9.60
2	515.84	512.00	507.20	512.32	511.84	8.64
3	512.00	509.12	510.08	506.56	509.44	5.44
4	518.40	507.20	503.68	509.76	509.76	14.72
5	503.68	507.52	518.72	515.20	511.28	15.04
6	510.08	512.32	516.48	512.96	512.96	6.40
7	504.00	518.72	512.32	507.52		
8	506.24	510.08	512.64	510.08		
9	513.28	511.36	505.60	511.36		
10	500.48	509.76	513.60	513.60		
11	515.52	515.20	512.32	506.24		
12	503.04	507.20	515.84	516.80		
13	507.20	512.00	503.68	511.36		
14	503.36	506.88	510.72	515.20		
15	518.40	512.32	515.20	508.48		

Table Q3(b)

End of Page

Relevant Equations

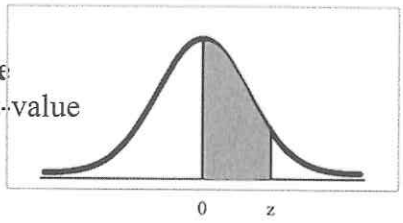
1	$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$	$\sigma_{(x)} = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$	$\sigma = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2}$
2	$\mathrm{UCL}_{(\bar{x})} = \bar{\bar{x}} + z\sigma_{\bar{x}}$	$\mathrm{LCL}_{(\bar{x})} = \bar{\bar{x}} - z\sigma_{\bar{x}}$	$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
3	$\mathrm{UCL}_{(R)} = D_4\bar{R}$	$\mathrm{LCL}_{(R)} = D_3\bar{R}$	
4	$\mathrm{UCL}_{(P)} = \bar{p} + z(\sigma_p)$	$\mathrm{LCL}_{(P)} = \bar{p} - z(\sigma_p)$	$\sigma_p = \sqrt{\frac{\bar{P}(1-\bar{P})}{n}}$
5	$\mathrm{UCL}_{(c)} = \bar{c} + z\sigma_c$	$\mathrm{LCL}_{(c)} = \bar{c} - z\sigma_c$	$\sigma_c = \sqrt{\bar{c}}$
6	System Reliability	$R_{SP}(t) = 1 - \prod_{i=1}^{n}[1 - R_i(t)]$	$R_{SS}(t) = R_1 \times R_2 \times R_3 \times .....R_n$

Table of Control Chart Constants for R-Chart

Sample Size *n*	D_3	D_4
2	0	3.267
3	0	2.574
4	0	2.282
5	0	2.114
6	0	2.004
7	0.076	1.924
8	0.136	1.864
9	0.184	1.816
10	0.223	1.777
11	0.256	1.744
12	0.283	1.717
13	0.307	1.693
14	0.328	1.672
15	0.347	1.653
16	0.363	1.637
17	0.378	1.622
18	0.391	1.608
19	0.403	1.597
20	0.415	1.585
21	0.425	1.575
22	0.434	1.566
23	0.443	1.557
24	0.451	1.548
25	0.459	1.541

TABLE A: The STANDARD NORMAL DISTIBUTION Table

"Cell" entries are areas under the N(0,1) curve between 0 and the z-value



NOTE: In calculating a z-value before entering these tables, always round correctly to two places of decimal.

0.0000	0.0100	0.0200	0.0300	0.0400	0.0500	0.0600	0.0700	0.0800	0.0900	
0.0000	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1000	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2000	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3000	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4000	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5000	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6000	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7000	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8000	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9000	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0000	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1000	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2000	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3000	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4000	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5000	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6000	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7000	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8000	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9000	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0000	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1000	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2000	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3000	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4000	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5000	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6000	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7000	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8000	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9000	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0000	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

Template for Question 3(b)

(To be stapled together and submitted with the answer script, if used)

Student ID: | | | | | | | | | | |

Sample Number	Content of Soft Drink in millilitre				Average	Range
	Obsv 1	Obsv 2	Obsv 3	Obsv 4	$\overline{x}$	R
1	507.20	512.64	516.80	509.76	511.60	9.60
2	515.84	512.00	507.20	512.32	511.84	8.64
3	512.00	509.12	510.08	506.56	509.44	5.44
4	518.40	507.20	503.68	509.76	509.76	14.72
5	503.68	507.52	518.72	515.20	511.28	15.04
6	510.08	512.32	516.48	512.96	512.96	6.40
7	504.00	518.72	512.32	507.52		
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11	515.52	515.20	512.32	506.24		
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13	507.20	512.00	503.68	511.36		
14	503.36	506.88	510.72	515.20		
15	518.40	512.32	515.20	508.48		